



Impacts of Coastal Hazards on Tourism and Property Prices: Research Summary

Warren Kriesel, Associate Professor
Ag & Applied Economics, University of Georgia

Introduction

During 1997-1999, researchers at the University of Georgia conducted two studies into how coastal hazards such as erosion, storms and flooding affect tourism and property prices. The first study was funded by the Georgia Sea Grant College Program. The second study, mandated by the US Congress under the National Flood Insurance Reform Act of 1994, was funded by the Federal Emergency Management Agency and the H. John Heinz III Center for Science, Economics and the Environment.

You are receiving this research summary because you were kind enough to respond to our survey.

To make a long story very short, we found that flooding and erosion hazards, and the actions taken against them, were major determinants of tourism and property prices in coastal areas. Flood insurance, however, was not found to have a statistically significant role in the real estate market. Also, the demand for flood insurance was found to be unresponsive to changes in insurance prices.

If new construction were built inland from the 60-year erosion hazard area, property prices would increase and disruptions to the coastal ecosystem might be reduced. Coastal armoring increased the value of waterfront properties but if the recreational beach became degraded then the resulting loss of tourism would reduce inland property prices sharply. Counteracting erosion by a sand nourishment project may prevent degradation, but future beach maintenance costs may be very high.

The Sea Grant Study

This was a study of beach management alternatives at Jekyll Island and Tybee Island, Georgia. Substantial stretches of their shores are armored against erosion, and at high tide the beach disappears. In our questionnaire, beach visitors viewed computer images of how beach conditions could be improved. They were informed that the improvements would have to be paid for by an increase in the existing parking fees. They were then asked if they preferred the alternate beach conditions at the higher price, and if so, how much they would visit the beach. A total of 3,244 beach visitors responded to our survey for a response rate of 52.53 percent.

The average visitor spent 7.8 days per year at one of these islands. We found that if beach conditions were improved and if the existing parking fee was raised a little bit, by up to \$0.50 per day, the visitors would spend an extra half-day at the islands. Thus, people would respond to wider beaches and less armoring by visiting the beach more even if they paid a little more.

At higher price increases above \$1.00 per day, the average visitor's stay would be reduced to 6.9 days. However, the additional revenue from parking fees would be sufficient to finance beach improvements without subsidies from the state or federal government. We found that local people would make 40 percent more visits to these islands than nonlocal people if the beaches were improved.

We also wanted to know what people thought of the two major beach improvement techniques: (a)



sand nourishment and (b) a "retreat" policy where buildings threatened by erosion are removed. Some people were presented with a different questionnaire version that said the beach improvements would be made by a beach nourishment project, but their trip response was not significantly different from those who were not informed about the specific improvement technique. Likewise, a questionnaire that promised a "retreat" policy did not elicit significantly different responses.

The FEMA/ Heinz Study

Data for the Study

In the study's first phase, 19 sites around the country were selected by FEMA. For each study site, each state's coastal zone management personnel used aerial photographs and geological data to define the Erosion Hazard Area. The EHA is any strip of coastal land that could disappear in the next 60 years, given historical erosion rates and other data. Within these sites a team surveyed a random sample of properties and collected data on certain characteristics such as their flood elevation, distance from the shore, etc. Other property data were obtained from public records at county courthouses.

Questionnaires were mailed to property owners in these study sites. About 3,600 questionnaires were returned for a response rate of 37 percent.

The average head of household was 58 years old with an annual income of over \$100,000 and had attended college. Thirty-five percent of respondents were retired and 41 percent of the properties had flood insurance. Thirty-two percent said their mortgage lender required them to have it, leaving nine percent of owners who had purchased insurance voluntarily.

The Determinants of Coastal Property Prices

We used a statistical technique called regression analysis. This is a research method that can measure how the price of property is explained by property characteristics such as square footage, age of the house, number of bedrooms, etc. Eight of

these structural characteristics were used, plus 12 other characteristics that described the nearest shoreline in terms of amenities and the risks of damage.

Economic theory says that prospective homebuyers gather information and become aware of the risks of owning coastal property. This means that for two identical neighboring properties, the house that appears less risky should sell for more. This was exactly what we found. Protection from flooding was measured by the elevation of the house's first floor above the 100-year flood level. Protection from erosion damage was measured by geological time. Geological time was calculated as the number of years until erosion reduces the distance between the building and the water's edge to zero.

A variable like geological time works well for measuring erosion protection because it encapsulates both the erosion rate and the amount of expendable land that cushions the property. It reflects the trade that many homebuyers make. A high erosion rate of 3 feet per year matters little if there are 300 feet separating the house from the water, but it matters more if only 50 feet are left.

The characteristics used to explain property prices (in order of importance) were: (1) year the house was bought; (2) geological time; (3) square footage of the house; (4) whether there was a fireplace; (5) whether it was waterfront; (6) whether there was a brick or stone exterior; (7) flood elevation; (8) square footage of the parcel; (9) whether the beach was renourished; (10) miles to the closest central business district; (11) number of bedrooms; (12) distance between the house and the water's edge; (13) presence of a seawall or other shoreline armoring; (14) age of the house; (15) width of the beach; (16) whether the house was built after flood zone identification; (17) whether the FEMA construction code was followed; (18) whether the property was inside a Coastal Barrier Resource Zone; (19) whether the house was on a bluff above the water; and (20) the price of flood insurance.

To be sure, there are many other characteristics that determine property prices, but they tended to be statistically insignificant. The averages of some property characteristics are listed in Table 1.

Table 1: Averages of coastal property characteristics for 1,343 mail questionnaire respondents, 1999.

| Characteristic | Atlantic Region | Gulf Coast | Great Lakes | Pacific Region |
|---------------------------------|-----------------|------------|-------------|----------------|
| Number of Properties | 592 | 276 | 254 | 221 |
| Reported price (1999 \$) | \$495,400 | \$275,400 | \$299,900 | \$1,133,300 |
| House size (sq ft) | 2,110 | 1,640 | 2,260 | 2,140 |
| Age of House | 28 | 22 | 48 | 40 |
| Number of Bedrooms | 4.06 | 2.69 | 3.15 | 2.94 |
| Percent at renourished beach | 44.7 | 2.69 | 0 | 6.7 |
| Percent at armored shoreline | 20.6 | 8.9 | 46.8 | 46.1 |
| Historical erosion rate (ft/yr) | 2.2 | 4.5 | 1.2 | 0.6 |
| Geological time (years) | 3,920 | 3,380 | 2,430 | 4,170 |

Regression analysis reveals how each property characteristic explains prices, and it can also predict the sales price of a house for a given set of characteristics. When predictions are generated over a range of a characteristic, the result is a graph of price responses.

Figure 1 is a graph of how property price responds to geological time. Price discounting starts gradually, but it drops precipitously when the house is visibly endangered, at around 60 years. In the Atlantic, a property that has 60 years of geological time is worth 5.8 percent more than a comparable house with 30 years of geological time, and it is worth 38 percent more than a house with one year remaining.

Why does this happen? Few buyers bother to find statistics on the history of erosion near their purchase, and probably no one bothers to calculate something like geological time. However, prospective buyers routinely gather all possible information about their purchase. Does it need painting? Does it have termites? Is it haunted?

Erosion and flooding risks have been well reported in the news. Therefore, coastal property buyers will look for clues that their purchase carries

an acceptable level of risk. When did the last flood occur? Is erosion eating away the land rapidly? How dependable is the sea wall? In the same way that high-quality house prices are bid up in the real estate market, so too are low-risk houses bid up.

Other notable results of this analysis were:

- Over the last 50 years, the value of coastal properties appreciated at an average annual 7 percent nominal rate.
- A waterfront property was worth from 8 percent (Gulf) to 45 percent (Great Lakes) more than a comparable property that is inland.
- Houses that are elevated above the 100-year flood level were worth significantly more than low-lying houses.
- Waterfront properties that were protected by shoreline armoring were worth more than unprotected properties.
- Properties located near a wide, high tide beach were worth more, and the difference in price between natural and renourished beaches was not statistically significant.
- Since 1983, flood insurance has been denied to new construction in Coastal Barrier Resource Zones. Recently-constructed houses inside those

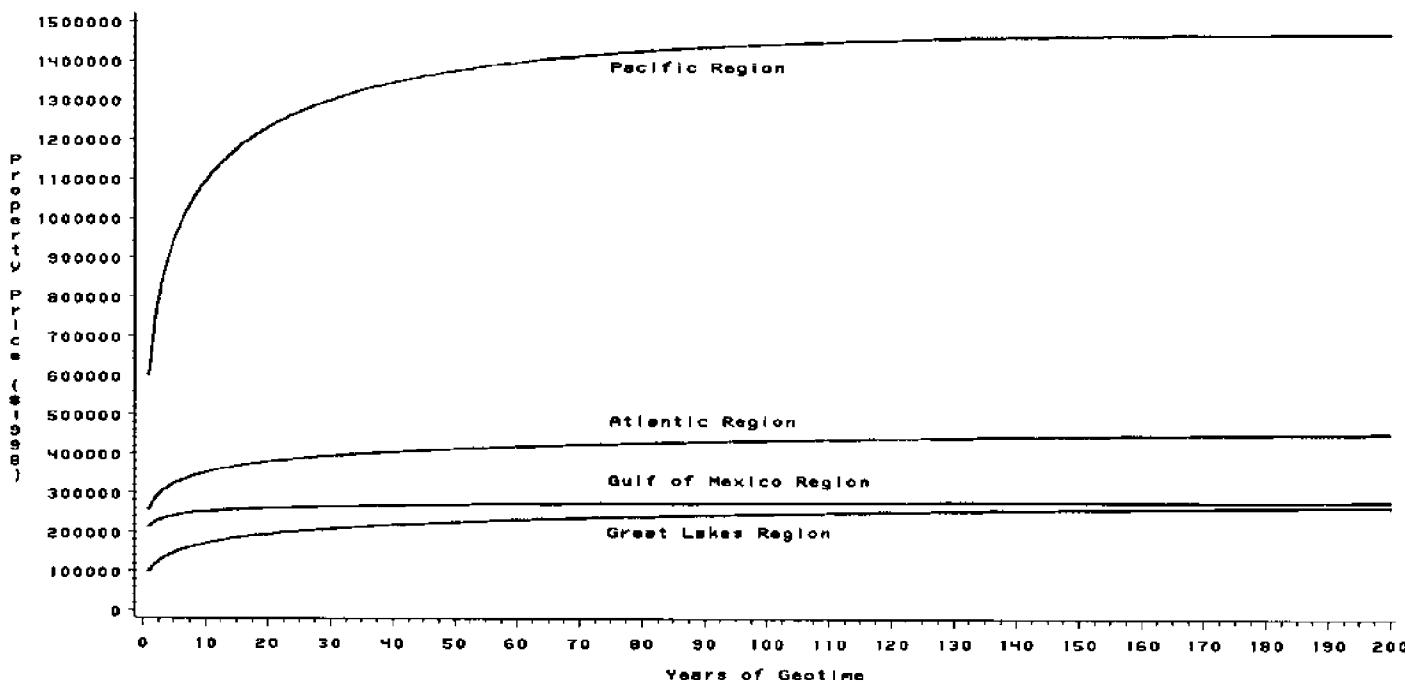


Figure 1: Response of property price to changes in geological time, four regional hedonic models, 1998-99.

zones in the Atlantic region were worth slightly less than similar properties outside the zones, but the effect was not statistically significant.

- We tried to estimate how removing subsidies for flood insurance would reduce property prices. This was not successful because the price of flood insurance was a statistically insignificant factor.
- Constructing new buildings landward from the 60-year erosion hazard area would increase property prices by 17 percent on those lots that have sufficient space, and perhaps reduce disruptions to the coastal ecosystem.

Analyzing Participation Rates in NFIP

Two perennial questions about the National Flood Insurance Program are: why do people buy flood insurance, and how can more be encouraged to participate in the program? Some of the questions that you answered supplied the data for this analysis.

We found that the average city had a 40.4 percent participation rate in NFIP, and 31 percent bought it because of FHA mortgage requirements,

leaving a nine percent voluntary participation rate in NFIP. Low participation was caused by a combination of four factors: (1) owners perceive that NFIP undercompensates for losses, (2) owners might underestimate their chances of suffering damage, (3) coastal property owners may tend to be risk takers, and (4) some property owners think that government disaster relief programs will compensate them.

Seven factors were statistically important in explaining participation rates such as the percent of owners required to buy insurance by their mortgage lender, and other insurance factors. Surprisingly, the price of flood insurance was not an important predictor of participation.

We discovered that the asset protection that owners got from flood insurance was not an effective substitute for risk-reducing property characteristics such as beach nourishment or armoring. This fact, plus the low participation rate, means that people would continue to construct hard stabilization rather than protect their property investments from coastal risks with insurance.

Analyzing Potential Demand for New Insurance

One policy option facing the NFIP is to offer a new insurance product that would cover “sunny day” losses from erosion damage. In the mail survey questionnaire you were asked whether or not you would buy this insurance if it increased your flood insurance premium by a dollar amount that we wrote in. The dollar amount was one of 30 randomly-assigned prices that varied from \$25 to \$30,000, and your yes/no response was analyzed with a logistic regression model.

The acceptance rate was above 70 percent for prices up to \$750/year and declined to zero for prices above \$20,000/year. The presence of shore armoring did not affect the decision to buy erosion coverage. This means that armoring is probably not a substitute for insurance. This suggests that altering insurance availability or price will probably not affect future construction of shore armoring.

The Economic Impact of Beach Degradation

Our last analysis examined how property prices differed in two types of coastal communities. We divided our data set according to whether a property was in a coastal community that supported beach-related tourism and recreation or whether it was in an ordinary coastal community. A community was judged to support beach tourism and recreation if it had been mentioned favorably in the book

America's Best Beaches by Dr. Stephen Leatherman (Florida International University Press, 1998).

We found that in the southeastern US, the average property's price in an ordinary coastal community was only 80 percent of a comparable property located in a “Leatherman” community. In the Pacific, the proportion is 75 percent. This is because recreational beaches are more attractive to visitors and new residents. Their demands for lodging drive up prices for waterfront lots and for the lots farther inland as well.

These results illustrate what a community might lose when its beach becomes less attractive to new residents and visitors. A waterfront property can increase its value by 25.8 percent with protective coastal armoring, but inland properties gain nothing

because they do not need the protection. In the southeastern US, if beach conditions deteriorate after the shore is armored so that recreation is significantly reduced, then a waterfront property would experience a net price increase of 5.8 percent from armoring. However, each inland property price would decline by 20 percent. Since the waterfront properties are typically outnumbered by inland properties, property prices throughout the entire community would be reduced and the tax base would be eroded.

It is very understandable that waterfront property owners should protect their real estate from erosion and flooding hazards. However, this protection may result in beach degradation, which in turn would reduce their inland neighbors' property values. There is strong evidence that all coastal property owners should act in their own financial self-interest to preserve the recreational potential and, by extension, the ecosystem diversity of their beach environment.

Beach nourishment seems to effectively preserve beach conditions in some areas like Miami Beach. But in many areas the new sand is eroded away quickly. For a longer term solution, coastal communities could exercise eminent domain and remove endangered buildings before the beach is damaged. Property owners could be compensated by several methods for financing public projects, including industrial revenue bonds.

The views expressed herein are those of the author and they may not coincide with those of the sponsoring agencies. This research was funded in part by grant NA66RG0282, project number R/SD-2, from the Georgia Sea Grant College Program, National Oceanic and Atmospheric Administration, and by contract EMW-97-CO-0375 with the Federal Emergency Management Agency, with the H. John Heinz III Center for Science, Economics and the Environment serving as primary contractor. Support was also provided by The University of Georgia. Full copies of these research reports can be downloaded in Adobe Acrobat format from: www.agecon.uga.edu/faculty/kriesel

Related web sites include:

www.heinzctr.org

www.haznet.org

www.fema.gov